UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
PREVENTION, PESTICIDES
AND
TOXIC SUBSTANCES

MEMORANDUM

SUBJECT: Risk Assessment and Science Support Branch: Final Draft Environmental Fate Science Chapter of Science Chapter For 1,4-Bis (bromoacetoxy)-2-butene. PC Code 03605, Case 3030, Barcode D251932.

FROM: Robert Quick, Chemist
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TO: Norm Cook, Chief
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Attached please find the following documents for the final draft environmental fate science chapter 1,4-Bis(bromoacetoxy)-2-butene:

1. Draft bibliography chapter (Norm Cook, Allen Vaughan, Najm Shamim)
2. Draft science chapter (Norm Cook, Allen Vaughan, Najm Shamim)

This is the final draft of these documents and concurrence and sign-off are required.

ENVIRONMENTAL FATE SCIENCE CHAPTER OF BIS (BROMOACETOXY)-2-BUTENE

EXECUTIVE SUMMARY

Bis (bromoacetoxy)-2-butene is used for controlling microbial growth in pulp and paper mills, secondary oil recovery injection water and as a preservative in water-based coatings. Under Part 158, Subpart W, these uses are considered to be primarily indoor uses with environmental discharges regulated under The Clean Water Act(CWA) and/or The Resource Conservation and Recovery Act (RCRA).

The only study submitted and on file is a hydrolysis study. The hydrolysis of bis (bromoacetoxy)-2- butene(BBAB) is pH dependent. At pH 5, the half-life was 8.25 days; at pH 7,the half-life was 6.89 hours and at pH 9, the half-life was 4.15 minutes. Under Part 158, Subpart W, this is the only study that is required to support these use patterns. Therefore, the environmental fate requirements for these use patterns are fulfilled.

ENVIRONMENTAL FATE ASSESSMENT OF BIS (BROMOACETOXY)-2-BUTENE

Hydrolysis(MRID No. 444584-01)

The registrant submitted a hydrolysis study to the Agency in a study entitled, "Hydrolysis of *cis* 1,4-Bisbromo- acetoxy-2-butene(BBAB) in Buffered AqueousSolutions". Radiolabeled ^{14}C-cis 1,4- Bis (bromoacetoxy)-2-butene (BBAB) at approximately 200 ppm in a sterile buffered aqueous solution was hydrolyzed at pH 5, 7 and 9. The half-life was found to be pH dependent.

The major degradate at all three pH levels was bromo- acetic acid; 1-bromoacetoxy -4-hydroxy-2-butene was also detected. At pH 5 only, the degradate 1- bromoacetoxy-4 acetoxy-2-butene was also found.

At pH 5, the percent radioactivity recovered was 102.5 percent of the applied radioactivity, 202.3 ppm BBAB on day 0. This steadily declined to 8.1% of the radioactivity applied on day 30.

At pH 7, the percent radioactivity recovered was 101.3 percent of the radioactivity applied, 200.9 ppm BBAB, on hour 0. This declined to 8.6% after 24 hours. BBAB was not observed in the 48 and 72 hour samples.

At pH 9, the percent radioactivity recovered was 67.8 percent of the applied radioactivity, 200.9 ppm BBAB, at time 0 and declined to 3.4 percent after approximately 20 minutes. BBAB was not found in the sample at 240 minutes.

The half-lives were calculated using regression analysis on the natural log of the average percent of applied BBAB observed at each sampling interval. At pH 5, the half- life was 8.25 days; at pH 7, the half-life was 6.89 hours; at pH 9, the half-life was 4.15 minutes.

The material balance using radiolabeled material was 91.1-103.2%.

The hydrolytic product, bromoacetic acid , was the major hydrolytic product at all three pH's 5,7 and 9. At pH 5, the hydrolytic product 1-bromoacetoxy-4-hydroxy-2- butene reached a maximum of 25.2% of the applied radioactivity on day 14 anddeclined to 19.5% of the the applied radioactivity on day 30. At pH 7, it reached a maximum of 23.6% of applied radioactivity in the 8 hour samples and declined to 5.5 percent at 72 hours. At pH 9, it reached a maximum of 25.6 percent of applied radioactivity at 10 minutes and declined to 16.6 percent

at 20 minutes and was not observed in the 240 minute samples. The hydrolysis product, 1-bromoacetoxy-4-acetoxy-2-butene, was observed at pH 5 and reached a maximum of 9.1 percent of applied radioactivity on day 21 and declined to 8.4 percent on day 20.

The hydrolysis study satisfies the environmental fate data requirement OPPTS GLN No. 161-1(835.2120) (MRID No.444584-01).

b. Environmental Fate Assessment

The use of Bis (bromoacetoxy)-2-butene in pulp and paper mills, in secondary oil recovery and in water-based coating are considered to be indoor uses under Part 158, Subpart W. For these uses the Agency only requires a hydrolysis study. However, we have the following additional comments:

i. Based on the Phase 3 comment from the Guideline Status Report, it appears that the photodegradation in water(161-2), photodegradation in soil(161-3), aerobic soil metabolism(162-1), anaerobic aquatic metabolism (162-3), leaching/adsorption/desorption(164-5) data requirements have been waived. Considering the proposed Part 158, Subpart W, data requirements, these data are not required at this time.

ii. The Agency considers the enhanced oil recovery use to generally be an environmentally contained system. The water for this type of use is injected into closed geological formations. Additionally, the application rate for BBAB will be 5.5 ounces of Busan 1210 (an 80% active product) per each 1000 barrels of water.The residence time of water injected into the ground is at least several days. In those cases where the enhanced oil recovery is not a closed system, the user must obtain a National Pollution Discharge Elimination System(NPDES) permit before discharging water from the oil recovery system into public waterways. The NPDES permit requires that the recovery water be filtered and cleaned to remove the oil-related contaminants prior to discharge. This will also likely remove a portion of the 1 ppm BBAB from the water.

iii. The use of Bis (bromoacetoxy)-2-butene in pulp and paper mills provides the potential for environmental exposure but this exposure is also regulated under the NPDES program of the CWA.

The use of BBAB in pulp and paper making allows the use of up to 0.30 pounds of BBAB per ton of paper.

The waste water from pulp and paper making is discharged into holding ponds or lagoons. The typical measurements for such lagoons are approximately one-forth mile wide and one-half mile long. Applications of BBAB in pulp and paper mills are generally intermittent, consisting of maximum cycles of 12 hours on followed by 12 hours off. The pH in lagoon water is typically 7 or higher.

The label use rate for BBAB is 3 ppm in the water. Therefore, the pulse dosing results in a potential discharge concentration of 1.5 ppm in the influent to discharge systems(This is based on the 12 hour treatment cycles resulting in a 50% dilution).

BBAB can be degraded by both hydrolysis and by biodegradation. The BBAB hydrolysis rate is pH dependent. At pH 7, the hydrolytic half-life of BBAB is 6.9 hours and at pH 9 the half-life of BBAB is 4 minutes. At the higher pH levels expected to be found in the paper mill discharge, the BBAB half-life is expected to be less than 7 hours in the lagoon water. The discharge water from paper mills typically are retained in the lagoons for several days.

The biodegradation rate of BBAB in paper mill discharge water was calculated using a BIODEG model developed in collaboration with the USEPA. Using this model and assuming biodegradation would be the only route of degradation, BBAB in discharge water into lagoons would be 0 ppb after 1 day in the lagoon.

Through a combination of hydrolysis and biodegradation, BBAB would be expected to be degraded in much less than 1-3 days after discharge into an aerated stabilization basin (lagoon).

Although OPP does not typically perform environmental fate, exposure and risk assessments for pulp and paper mill uses, we conclude that there will be little potential for environmental exposure from BBAB for the pulp and paper mill use.

REFERENCE

1. MRID# 444584-01. Hydrolysis of *cis* 1,4-Bisbromoacetoxy-2-butene(BBAB) in Buffered Aqueous Solutions. Samuel Paul Cohen. September 25, 1997. Performing Laboratory: Pittsburg Environmental Research Laboratory. Sponsor: Buckman Laboratories International,Inc.